

Table 3. Morphological comparison of *Quercus subhinoidea*, *Q. thorelii*, and *Q. chingsiensis*.

| Characters                                | <i>Q. subhinoidea</i> <sup>1,2,3</sup>           | <i>Q. thorelii</i> <sup>1,2,3</sup>                       | <i>Q. chingsiensis</i> <sup>1,2</sup> |
|---|--|---|---------------------------------------|
| Young twig and leaf                       | grayish yellow tomentose                         | golden woolly vestiture                                   | NA                                    |
| Mature leaf, adaxial surface              | glabrous and shiny                               | glabrous and shiny  | glabrous and shiny                    |
| Leaf size (length × width, cm)            | 6–15 × 3–6                                       | 9–17 × 3–6  | 8–10 × 3–5                            |
| Leaf lateral vein                         | 15 to 21(22) pairs                               | (11)12 to 19(20) pairs                                    | 11 to 13(14) pairs                    |
| Venation type                             | semicraspedodromous                              | semicraspedodromous                                       | semicraspedodromous                   |
| Fruit cupule size<br>(length × diam., cm) | 1.1–1.4 × 2.4–2.9                                | 1.2–1.8 × 2–3.1(–3.3)                                     | ca. 1 × 2.2                           |
| Cupule coverage of acorn                  | 3/4 to entire acorn                              | 3/4 to entire acorn                                       | entire acorn                          |
| Cupule wall thickness (mm)                | 1.1–3(–3.5)                                      | 1.5–3(–5)   | 2.2–3                                 |
| Acorn size (length × diam., cm)           | 1.4–1.7 × 1.8–2.4                                | 1–1.5 × 2.1–2.8   | ca. 0.7 × 2.5                         |
| Style base                                | concave or flat                                  | concave or flat   | concave                               |
| Acorn scar diameter and shape             | 1.3–1.8 cm, flat or<br>subconvex                 | 1.3–1.8(–2) cm, flat or<br>subconvex                      | 1.8–2 cm                              |
| Fruiting habit                            | fruit matures in current<br>year; late Sep.–Nov. | fruit matures in current year;<br>early Oct. to late Nov. | fruit matures in current<br>year      |

NA, not available.

<sup>1</sup> Observations from type materials.

<sup>2</sup> Observations from herbaria collections.

<sup>3</sup> Observations from living populations in the wild.

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# *Strobilanthes biocullata* (Acanthaceae), a New Species from Hunan, China

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**ABSTRACT.** A new species of Acanthaceae, *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood, from China, is described and illustrated. The species is found in Hunan, Guangxi, and Guangdong provinces, where it grows on rocks along streams. It clearly belongs to the group of species placed by Bremekamp in *Semnostachya* Bremek., but differs from all these by two swollen bulges on the dorsal surface of the long-acuminate bracts. *Strobilanthes biocullata* is the first Chinese species of *Strobilanthes* Blume reported to have a plietesial life history.

**Key words:** Acanthaceae, China, plietesial, *Strobilanthes*.

During botanical exploration in Hunan Province, China, a very distinctive new species of *Strobilanthes* Blume was found on rocks along streams (Fig. 1A). It is immediately distinguished from other species by the two swollen bulges on the dorsal surface of the bracts (Fig. 2D). This is another new species in the largest genus of Acanthaceae in China (Hu & Tsui, 2002; Deng et al., 2006), which has been identified during the course of revision of *Strobilanthes* for the forthcoming volume of *Flora of China* (Wood & Scotland, 2003b; Chen et al., 2006; Deng et al., 2006, 2007; Deng & Xia, 2007; He & Qin, 2007).

***Strobilanthes biocullata*** Y. F. Deng & J. R. I. Wood, sp. nov. TYPE: China. Hunan: Yuanling Xian, Jiemuxi Natural Reserve, Jiemuxi Cun, 750 m, on rock beside a stream, 12 July 2008, *Deng Yunfei 20741* (holotype, IBSC; isotypes, CAS, FHO, MO). Figures 1, 2.

Haec species quoad flores in spicas axillares efoliatis dispositis, corollam flexam glabram et grana pollinis prolata pseudocolpata ordinatione scalariformi ornata *Strobilanthis compactae* D. Fang & H. S. Lo et omnium specierum ad *Semnostachyam* Bremek. ascriptorum manifeste affinis, sed ab eis sicut congeneris omnibus bracteis tumoribus duobus elevatis dorsaliter instructis valde distincta.

Gregarious anisophyllous undershrub, 0.8–2 m tall. Stems subterete, bisulcate, glabrous. Leaves unequal in each pair, the smaller about half the size of the larger; petioles 1–5 cm, glabrous, sulcate; blades oblong-elliptic to elliptic, the larger 13–26 × 4–8 cm, the smaller 6–12 × 2–4 cm, glabrous, densely covered with cystoliths on both surfaces, apex acuminate, margin serrate, base narrowly cuneate, lateral veins 5 to 10 pairs, prominent on both surfaces, tertiary veins prominent. Spikes solitary, axillary, simple, leafless, (3–)7–10 cm (Fig. 1C); rachis glabrous, flowers in opposite pairs (occasionally single), the pairs 1–2 cm apart on the rachis. Bracts ovate, 3.5–5 × 2.5–3 mm, glabrous, apex long-acuminate to mucronate, the dorsal surface with 2 swollen bulges resembling eyes; bracteoles ovate-oblong, ca. 4 × 2 mm, glabrous, apex acuminate to mucronate, somewhat fragile and caducous. Calyx 1–1.2 cm, sparsely pubescent when young, glabrescent, subequally 5-lobed almost to the base, lobes lanceolate, apex long-acuminate, yellowish brown, 1-nerved. Corolla purplish blue, 3.5–4 cm, outside glabrous, inside glabrous except for hairs retaining the styles, basal tube cylindrical for 6–11 mm, ca. 3 mm wide, then bent to ca. 90° and gradually widened to ca. 2 cm at mouth, subequally 5-lobed, lobes ovate, ca. 4 × 7 mm, apex emarginate. Stamens 4, didynamous, included (Fig. 1D); filaments

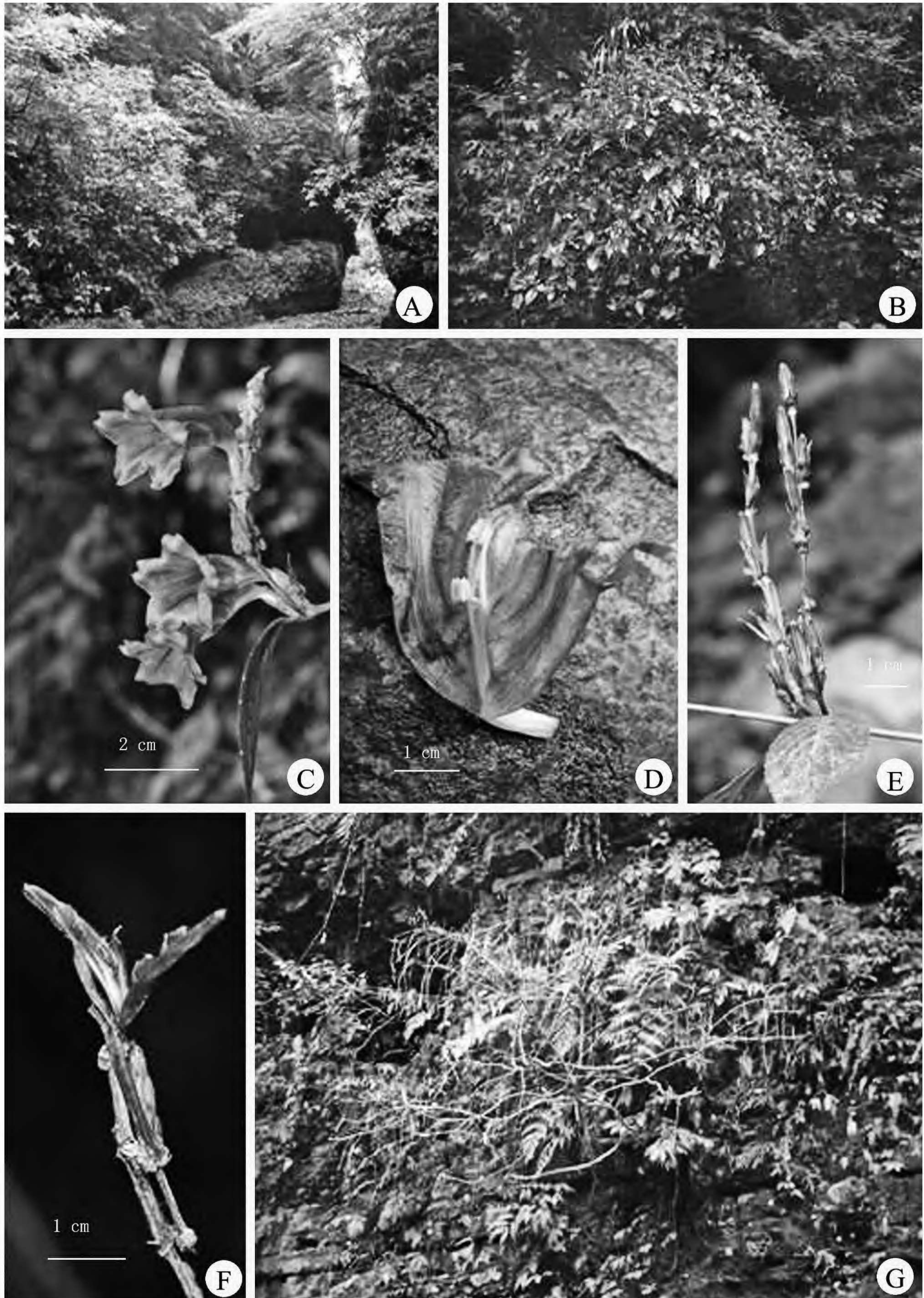


Figure 1. *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood. —A. Habitat. —B. Flowering plant. —C. Flowering spike. —D. Corolla opened up to show stamens. —E. Fruiting spike. —F. Open capsule. —G. Dead plants after flowering.

pilose, the longer pair ca. 1 cm long, the shorter pair ca. 0.3 cm long; anthers oblong, ca.  $3 \times 1.2$  mm; pollen prolate, tricolporate, bireticulate, pseudocolpi 12, scalariform,  $64.9 \times 36.9$   $\mu\text{m}$ , polar axis (P):equa-

torial diameter (E) = 1.76 (Fig. 3). Ovary glabrous, ca. 3 mm; style ca. 2.8 cm. Capsule clavate, 1.5–2 cm, glabrous, 4-seeded; seeds lenticular, ca.  $3 \times 3$  mm, densely appressed-pubescent, areole small (Fig. 2L).



Figure 2. *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood. —A. Flowering branch. —B. Leaf blade, adaxial (left) and abaxial (right) surfaces. —C. Tip of inflorescence. —D. Bract. —E. Bracteole. —F. Calyx, ovary, and style. —G. Corolla. —H. Corolla opened showing stamens. —I. Anther. —J. Stigma. —K. Capsule. —L. Seed. Drawing by Liu Yunxiao. A–J from Deng Yunfei 20741 (IBSC), K–L from Huang Hongquan s.n. (IBSC).

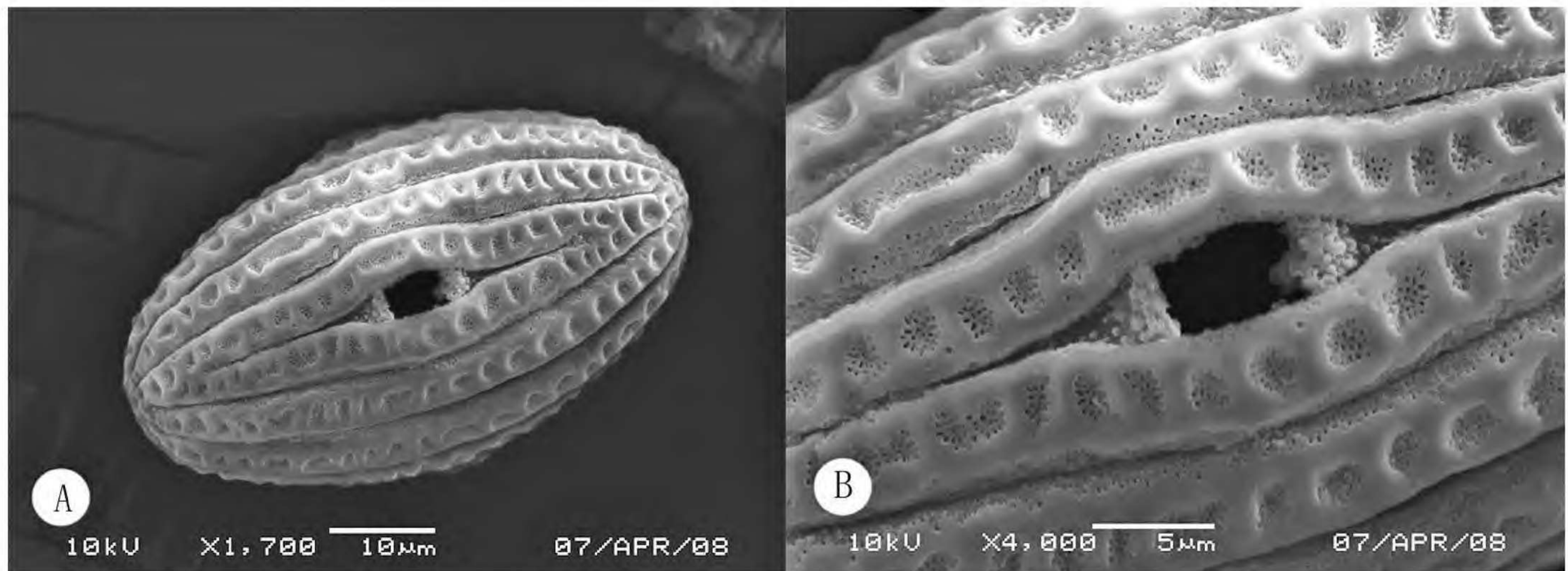


Figure 3. SEM images of pollen of *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood from *Deng Yunfei 19835* (IBSC). —A. Pollen grain. —B. Aperture.

*Distribution, habitat, and ecology.* *Strobilanthes biocullata* is endemic to China, occurring in Hunan, Guangdong, and Guangxi provinces. It was found in the Wulingshan and Western Nanling ranges. It grows on moist rocks along streams at altitudes of 200–800 m.

*IUCN Red List category.* *Strobilanthes biocullata* is not common, occurring in six isolated, small populations. It is probably not threatened and might be considered Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

*Phenology.* The new species is known to flower in July–September and to fruit in October–December.

*Etymology.* The specific epithet is derived from the Latin “bi-,” meaning “two,” and “ocullatus,” meaning “with eyes,” because this species can be easily distinguished from other species by its bracts, which have two extrorsely swollen bulges resembling eyes.

*Discussion.* *Strobilanthes biocullata* clearly belongs to the group of species placed by Bremekamp in the genus *Semnostachya* Bremek., which is exceptionally well represented in South China with some 14 species including *Strobilanthes longispicata* Hayata, *S. cystolithigera* Lindau, *S. abbreviata* Y. F. Deng & J. R. I. Wood, *S. guangxiensis* S. Z. Huang, *S. myura* Benoist, *S. longzhouensis* H. S. Lo & D. Fang, and *S. compacta* D. Fang & H. S. Lo. All species in this informal group have an inflorescence of leafless axillary spikes, which are sometimes aggregated into panicles; a calyx subequally 5-lobed to near the base; a corolla that is externally glabrous and strongly bent; and pollen that is always prolate, tricolporate, and bireticulate with scalariform patterning. This group of species is unusual in *Strobilanthes* because of the development of unusual structures on the dorsal

surface of the bracts in some species. These structures include rigid, scabrid hairs in the Philippine species *S. halconensis* Merr. and *S. cincinnalis* C. B. Clarke, sessile glands in *S. abbreviata* (Deng et al., 2006: 377–379), and the paired swollen bulges in the new species; this character noted for *S. biocullata* is unique not only within this species group but within the whole of *Strobilanthes*. *Strobilanthes biocullata* is perhaps most similar to *S. compacta*, but is easily distinguished from the latter by the distant, not imbricate, flowers on the spikes and the distinctive bracts (Luo et al., 1997).

In 2001, the first author collected this plant from Xinning Xian in Hunan Province (*Deng Yunfei 16065*) and found that all of the plants were dead the next year when he visited the site again. In 2008, however, the plants flowered again (*Deng Yunfei 20773*). It was reported that the plants never flowered between 2001 and 2007, so it seems that this species is flowering in 7- to 8-year cycles. This, therefore, is the first concrete evidence of a plietesial life history in *Strobilanthes* in China. Further evidence is provided by observations from another site where this species grows, Jiemuxi, Yuanling Xian in Hunan Province. Here Deng and Fu collected specimens in both 2007 and 2008. They found that plants that flowered in 2007 died after flowering, while those flowering in 2008 had not been in flower in 2007.

Plietesial species grow for many years, flower gregariously, and then die, in much the same manner as bamboo (Fuller, 1925; van Steenis, 1942; Janzen, 1976; Wood, 1994a; Daniel, 2006). This kind of life history is known from several families, but is best documented in the Bambusoideae (Poaceae) and Acanthaceae. In Acanthaceae, the phenomenon has been reported in at least five genera: *Strobilanthes*, *Isoglossa* Oerst. (Clarke, 1901; Tweedie, 1976; van Steenis, 1978; Poriazis & Balkwill, 2008), *Acantho-*

*pale* C. B. Clarke (Bergsdorf, 2006), *Mimulopsis* Schweinf. (Dale & Greenway, 1961; Tweedie, 1965), and *Stenostephanus* Nees (Daniel, 2006). Within *Strobilanthes* it was first noted more than 170 years ago when Nees (1836) described *S. sexennis* based on Walker's comment that this Sri Lankan species flowered every six years (Wood, 1994b: 110–111). Since then, this phenomenon has been reported from many other countries including Indonesia, Thailand, Myanmar (Burma), Bhutan, and India (Trimen, 1895; Kanjilal, 1901; Gamble, 1902; Parker, 1924; Osmaston, 1927; Robinson, 1935; van Steenis, 1942, 1985; Bremekamp, 1944; Bowden, 1950; Matthew, 1970; Biswas, 1975; Wood, 1994a, 1998; Carine, 1997; Scotland, 1998; Bennett & Hansen, 2000; Carine & Scotland, 2000; Carine et al., 2000; Garbyal, 2000; Wood & Scotland, 2003a: 84, 2009: 39; Wood et al., 2003). It is probable that many species of *Strobilanthes* from China are plietesial, but this is the first confirmed example, although Hu and Tsui (2002) suggested *S. tomentosa* (Nees) J. R. I. Wood (as *Aechmanthera tomentosa* Nees) might be plietesial.

**Paratypes.** CHINA. **Guangdong:** Lechang Shi, Pingshi Zhen, Jinjishan, 4 Nov. 1986, *Exped. Nanling 3462* (IBSC); Lechang Shi, Shaping Gongshe, Laixiage, July 1969, *Luo Xianrui s.n.* (IBSC). **Guangxi:** Linchuan Xian, Qifenshan, 1–11 Oct. 1937, *W. T. Tsang 28470* (A, SYS); Linchuan Xian, Chaotian Xiang, Qifenshan, 25 June 1952, *Liang Choufen 30425* (IBK); Xing'an Xian, Huajiang Qu, Ruilian to Chetan, 12 June 1953, *Exped. Guangxi 1170* (KUN, PE). **Hunan:** Xinning Xian, Mishaizhai, 450 m, 14 Sep. 1985, *Luo Yibo 3390* (PE); Xinning Xian, Langshan, Zixiadong, 25 Aug. 2001, *Deng Yunfei 16065* (IBSC); Xinning Xian, Langshan, Zixiadong, 400 m, 1 Aug. 2008, *Deng Yunfei 20773* (IBSC); Yuanling Xian, Jiemuxi, 750 m, 16 Sep. 2007, *Deng Yunfei with Fu Ying 19835* (IBSC); Yuanling Xian, Leyixi, 200 m, 13 July 2008, *Deng Yunfei with Fu Ying 20752* (IBSC); Zhangjiajie, Yongding Qu, Tianmenshan, Laodaoxi, ca. 300 m, June 2008, *Huang Hongquan s.n.* (IBSC); Zhangjiajie Shi, Yongding Qu, Tianmenshan, Laodaoxi, ca. 300 m, 10 July 2008, *Deng Yunfei 20740* (IBSC).

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